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KENYON & KENYON LLP
1500 K STREET N.W.
WASHINGTON, DC 20005

EXAMINER
CHAO, MICHAEL W

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/584,904	SAUERMANN, VOLKER
	Examiner	Art Unit	
	Michael Chao	4121	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>26 October 2006</u>.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-23</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-23</u> is/are rejected.

7)☒ Claim(s) <u>10,11 and 20</u> is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on <u>28 June 2006</u> is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>10/26/2006</u>.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Specification

1.   The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

35 USC § 112

2.   The following is a quotation of the sixth paragraph of 35 U.S.C. 112:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

1.   Claim 19 contains the phrase means or step for. This is considered to have invoked §112 sixth paragraph. It has been construed as covering the corresponding structure, material, or acts described in the specification and equivalents thereof.

Claim Objections

2.   Claims 10, 11, 20 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

3.   Claim 10 contains "wherein the objects are database tables of various sizes". This does not alter the method of its parent claim 1 as it does not matter what is being assigned to the processing units.

4.   Claim 11 contains "wherein each one of the processing units is a blade or a blade server". This does not alter the method of the parent claim 1 as the method is not affected by the type of elements being optimized.

5.   Claim 20 contains "each processing unit being a single-board computer having a bus interface to a bus system that couples the single-board computers". This does not alter the product of the parent claim 1 as the method is not affected by the type of elements being optimized.

Claim Rejections - 35 USC § 101

6.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7.   Claims 1-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

8.   A § 101 process must be tied to another statutory class (such as a particular apparatus) or transform underlying subject matter (such as an article or materials) to a different state or thing. If neither of these requirements is met by the claim the method is not a patent eligible process under § 101. Claims 1-23 do not require a machine manufacture or composition of matter nor does it transform any subject matter; as such it is non-statutory under § 101.

Claim Rejections - 35 USC § 112

9.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the applicant regards as his invention.

10.   Claims 1-23 are rejected under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

11.   Claims 1, 13, 21 state "deleting of the objects that are assigned to the processing

unit from the sequence." Object as commonly known in the art of Object Oriented

Programming are useful because they can be commonly referenced. "Assigning an

object" seems to mean that the object is commonly referenced by the "processing unit"

and the "sequence", in which case deleting the object would have the effect of nullifying

the reference. It has been construed to mean that the "removing said assigned objects

from the sequence of objects remaining to be processed."

12.   Claims 1-23 commonly contain "remaining load capacity of the processing unit is

too small for consecutive objects". This is in contradiction to the specification which

states on page 11 lines 21-22; "Next consecutive tables in the ordered sequence are

searched that have table sizes and table loads that fit into the respective gaps Gs and

Gl." The issue is that consecutive tables indicate that only tables adjacent to the one

selected for a match are considered, whereas what is seemingly intended in the

detailed description is "tables are searched in descending order".

Claim Rejections - 35 USC § 102

13.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

14.   Claims 1-4, 12-14, 18, 19, 21 are rejected under 35 U.S.C. 102(b) as being

anticipated by Leinberger et al. as shown in (Multi-Capacity Bin Packing Algorithms with

Applications to Job Scheduling under Multiple Constraints), hereafter referred to as

Leinberger.

15.   With respect to claim 1, 13, Leinberger teaches; assigning objects to processing

units of a cluster of processing units, each one of the objects having an object size and

an object load, ("In general, the d-capacity bin-packing algorithms are extensions of the

single capacity bin-packing algorithms" page 4, paragraph 1) each one of the

processing units having a storage capacity and a load capacity, the method comprising

the steps of:

a) calculating an index based on object size and object load for each one of the objects,

("In the d-capacity formulation, however, the items are sorted based on a scalar

representation of the d components." page 5 paragraph 4)

b) sorting of the objects by index to provide a sequence of objects; ("First-Fit

Decreasing (FFD) first sorts the list L in non-increasing order and <u>then</u> applies the First-

Fit packing algorithm." page 5 paragraph 4)

c) for each processing unit of the cluster:

assigning of one or more of the objects to the processing unit in sequential order until a

remaining storage capacity and a remaining load capacity of the processing unit is too

small for consecutive objects of the sequence; ("The Next-Fit (NF) algorithm takes the

next d-capacity item X_i and attempts to place it in the current bin B_k. If it does not fit

then a new bin, B_{k+1} is started." page 5 paragraph 3)

deleting of the objects that are assigned to the processing unit from the sequence.

16.   Regarding claims 2, 14, Leinberger teaches; wherein step 1 c) is carried out

repeatedly (page 5 paragraph 3) until the sequence is empty in order to provide a

minimum number of the processing units. ("Again, the goal is to partition the list L into

as few bins B_k as possible." page 5 paragraph 2)

17.   Regarding claim 3, Leinberger teaches; wherein the remaining storage capacity

is determined by the difference between the storage capacity and the aggregated size

of objects being assigned to the processing unit. ("If it does not fit (ie, if $X_{ij} + B_{kj} > C_j$ for

some j) then a new bin, B_{k+1}, is started." page 5 paragraph 3)

18.   Regarding claim 4, Leinberger teaches; wherein the remaining load capacity is

determined by the difference between the load capacity and the aggregated loads of

objects being assigned to the processing unit. (page 5 paragraph 3)

19.   Regarding claims 12, 18, Leinberger teaches; the index of an object is calculated

based on the sum of the normalised object size and object load and based on the

absolute value of a difference between the normalised object size and the normalised

object load. ("In the d-capacity formulation, however, the items are sorted based on a

scalar representation of the d components." page 5 paragraph 4)

20.   Regarding claim 19, Leinberger teaches; A data processing system for

determining a minimum number of processing units of a cluster of processing units for a

given number of objects having various object sizes and object loads, the data

processing system comprising:

means for calculating an index based on object size and object load for each one of the objects, ("In the d-capacity formulation, however, the items are sorted based on a scalar representation of the d components." page 5 paragraph 4)

means for assigning of one or more of the objects to a processing unit in sequential order until a remaining storage capacity and/or a remaining load capacity of the processing unit is too small for consecutive objects of the sequence and for deleting of the objects that are assigned to the processing unit from the sequence[[.]] ,and ("The Next-Fit (NF) algorithm takes the next d-capacity item Xi and attempts to place it in the current bin Bk. If it does not fit then a new bin, Bk+1 is started." page 5 paragraph 3)

means for outputting of the minimum number of the processing units. ("Again, the goal is to partition the list L into as few bins Bk as possible." page 5 paragraph 2)

21.   Regarding claim 21, Leinberger teaches; A blade server having balancing means for dynamically assigning objects to a plurality of blade servers, each one of the objects having an assigned index that is based on object size and object load, the balancing means being adapted to assign objects to the blade servers by the steps of:

a) sorting of the objects by index to provide a sequence of objects; ("In the d-capacity formulation, however, the items are sorted based on a scalar representation of the d components." page 5 paragraph 4)

b) for each processing unit of the cluster:

assigning of one or more of the objects to the processing unit in sequential order until a remaining storage capacity and/or a remaining load capacity of the processing unit is

too small for consecutive objects of the sequence; ("The Next-Fit (NF) algorithm takes

the next d-capacity item Xi and attempts to place it in the current bin Bk. If it does not fit

then a new bin, Bk+1 is started." page 5 paragraph 3)

deleting of the objects that are assigned to the processing unit from the sequence.

Claim Rejections - 35 USC § 103

22.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

23.   Claims 5, 6, 15, 16, 22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Leinberger as applied to claims 1, 13 above, and further in view of

feedback, as demonstrated by 'Schaum's Outline of Theory and Problems of Feedback

and Control Systems'.

24.   Regarding claims 5, 15, 22, Leinberger does not teach; the steps of:

d) determining a first largest gap between the aggregated size of objects being

assigned to one of the processing units and the storage capacity,

e) determining a second largest gap between the aggregated load of objects being

assigned to one of the processing units and the load capacity,

f) subtracting the first largest gap divided by the number of processing units from the

storage capacity to provide a first threshold,

g) subtracting the second largest gap divided by the number of processing units from

the load capacity to provide a second threshold,

h) performing step 1 c) again, wherein the remaining storage capacity is the difference

between the aggregated size of the objects being assigned to the processing unit and

the first threshold, and whereby the remaining load capacity is the difference between

the aggregated load of the objects being assigned to the processing unit and the

second threshold. However, it would have been obvious at the time the invention was

made to a person of ordinary skill in the art to use feedback, as shown in 'Schaum's

Outline of Theory and Problems of Feedback and Control Systems', in order to obtain a

more optimal solution. This would have been done by using the error of the previous

solution, (see Definition 7.2 H) to modify the input parameters of the algorithm, (see

Definition 7.6 B/R) and feeding it back into the algorithm to obtain a new estimated

solution (see Definition 7.4 C/R). A person of ordinary skill in the art would have done

this in order to more accurately alleviate the "capacity imbalance" of Leinberger.

(Leinberger page 8 paragraph 3)

25.   Regarding claims 6, 16, Leinberger does not teach; the steps of:

d) determining the total of the sizes of the objects,

e) determining the total of the loads of the objects,

f) determining a first difference between the total of the storage capacities of the

minimum number of processing units and the total of the sizes of the objects,

g) determining a second difference between the total of the load capacities of the

minimum number of processing units and the total of the load of the objects,

h) subtracting the first difference divided by the minimum number of processing units

from the storage capacity to provide a first threshold,

i) subtracting the second difference divided by the minimum number of processing units from the load capacity to provide a second threshold,

j) performing step 1 c) again, whereby wherein the remaining storage capacity is determined by the difference between the aggregated size of the objects being assigned to the processing unit and the first threshold, and whereby the remaining load capacity is determined by the difference between the aggregated load of the objects being assigned to the processing unit and the second threshold,

k) if as a result of step 6j) there is an excess amount of memory requirement for one of the processing units that surpasses the first threshold, dividing the excess amount by the minimum number of processing units and increasing the first threshold by the result of the division, and

l) if as result of step 6 j) there is an excess load requirement for one of the processing units that surpasses the second threshold, dividing the excess load by the minimum number of processing units and increasing the second threshold by the result of the division,

wherein steps 6 j), 6 k) and 6 1) are performed repeatedly until there is no such excess amount of memory requirement and no such excess load requirement. However, it would have been obvious at the time the invention was made to a person of ordinary skill in the art to use feedback, as shown in 'Schaum's Outline of Theory and Problems of Feedback and Control Systems', in order to obtain a more optimal solution. This would have been done by using the error of the previous solution, (see Definition 7.2 H)

to modify the input parameters of the algorithm, (see Definition 7.6 B/R) and feeding it

back into the algorithm to obtain a new estimated solution (see Definition 7.4 C/R). A

person of ordinary skill in the art would have done this in order to more accurately

alleviate the "capacity imbalance" of Leinberger. (Leinberger page 8 paragraph 3)

26.   Claims 7, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Leinberger as applied to claims 1, 13 above, and further in view of Guess and Check,

as shown in 'Math Central Guess and Check' posting.

27.   Regarding claims 7, 17, Leinberger does not teach; the steps of:

d) stepwise varying the first and second thresholds between respective first and second

limits,

e) performing step 1 c) for each first and second threshold value, wherein the remaining

storage capacity is the difference between the aggregated size of the objects being

assigned to the processing unit and the first threshold, the remaining load capacity is

the difference between the aggregated load of the objects being assigned to the

processing unit and the second threshold, and a statistical measure is calculated for the

assignment of objects to the processing unit, and

f) selecting one of the assignments of objects to processing units based on the

statistical measure.

However, it would have been obvious at the time the invention was made to a person of

ordinary skill in the art to use a Guess and Check method to find the better solution over

a set of input variables (see the tabular example on page 2 of 'Math Central Guess and

Check'). A person of ordinary skill in the art would have done this by attempting a range

of starting variables and measuring their relative efficacy. It would have been obvious at the time the invention was made to a person of ordinary skill in the art in order to converge upon a better solution for the bins of Leinberger. (see Leinberger Figures 2 and 3)

28.   Claims 8, 9, 20, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leinberger combined with Guess and Check as applied to claims 7, 17 above.

29.   Regarding claim 8, Leinberger combined with Guess and Check as shown in claims 7, 19 do not explicitly teach; wherein:

the first limit of the first threshold is given by the aggregated size of the objects divided by the minimum number of processing units, and whereby

the second limit of the first threshold is given by the storage capacity, and

the first limit of the second threshold is given by the aggregated load of the objects divided by the minimum number of processing units, and whereby

the second limit of the second threshold is given by the load capacity.

It was obvious that the total capacity is the difference between the assigned capacity and the total capacity, and that any optimized solution to the bin packing problem would necessarily lie between these two thresholds. Evidence of Leinbergers knowledge and use of this concept is shown in his computation of bin capacity: "If it does not fit (ie, if X_{ij} + B_{kj} > C_j for some j) then a new bin, B_{k+1}, is started." (page 5 paragraph 3). It would have been obvious at the time the invention was made to a person of ordinary skill in the art to use these two thresholds as a starting point for further optimization, since any value outside of these is either worse, or unworkable.

30.   Regarding claim 9, Lienberger combined with Guess and Check as shown in claim 7 does not teach; wherein the statistical measure is calculated by calculation of a standard deviation or a variance of the totals of the indices of objects assigned to one processing unit. Since it was necessary to use some function in assessing the deviation from an optimal solution, it would have been obvious to use a standard deviation or a variance, a well known statistical measure, to assess the desirability of the Guess and Check combined with the packing of Leinberger. This would have been done by measuring the dispersion of the elements through the bins by using their indexes as a numerical representation of their dispersion. It would have been obvious at the time the invention was made to a person of ordinary skill in the art to use standard deviation or variance to measure the optimality of the guessed solution of Lienberger and the Guess and Check heuristic in order to evaluate the optimality of the solution.

31.   Regarding claim 20, Lienberger combined with Guess and Check as in claim 19, does not teach; each processing unit being a single-board computer having a bus interface to a bus system that couples the single-board computers. It would have been obvious at the time the invention was made to a person of ordinary skill in the art that the bin packing algorithm of Lienberger could be applied to processes on blade servers. This would have been done by quantizing the requirements of the processes and the capacity of the blade servers and then executing the bin packing algorithm of Lienberger to obtain an optimal solution.

32.   Regarding claim 23, Lienberger combined with Guess and Check as shown in claim 8 does not teach; wherein the statistical measure is calculated by calculation of a

standard deviation or a variance of the totals of the indices of objects assigned to one

processing unit. Since it was necessary to use some function in assessing the deviation

from an optimal solution, it would have been obvious to use a standard deviation or a

variance, a well known statistical measure, to assess the desirability of the Guess and

Check combined with the packing of Leinberger. This would have been done by

measuring the dispersion of the elements through the bins by using their indexes as a

numerical representation of their dispersion. It would have been obvious at the time the

invention was made to a person of ordinary skill in the art to use standard deviation or

variance to measure the optimality of the guessed solution of Lienberger and the Guess

and Check heuristic in order to evaluate the optimality of the solution.

33.   Claims 10, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Lienberger.

34.   Regarding claim 10, Lienberger does not teach; wherein the objects are

database tables of various sizes. However, it would have been obvious at the time the

invention was made to a person of ordinary skill in the art, that data structures could be

packed using the bin packing algorithm. In view of the evidence of record, one of

ordinary skill in the art would have done this by estimating the requirements of the

database tables and packing them into memory using the bin packing algorithm of

Lienberger. A person of ordinary skill in the art would have done this in order to estimate

the minimal number of memory elements that contiguous database tables could be

loaded onto.

35.   Regarding claim 11, Lienberger does not teach; wherein each one of the

processing units is a blade or a blade server. It would have been obvious at the time the

invention was made to a person of ordinary skill in the art that the bin packing algorithm

of Lienberger could be applied to processes on blade servers. This would have been

done by quantizing the requirements of the processes and the capacity of the blade

servers and then executing the bin packing algorithm of Lienberger to obtain an optimal

solution.

Conclusion

36.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure.

      a.   Kahn, Markus et al. (EP 1,643,364) discloses a method of bin packing.

      b.   Joslin et al. (U.S. 6,272,483) discloses scheduling heuristics with

      optimization.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Chao whose telephone number is (571)270-5657. The examiner can normally be reached on Monday - Thursday, 8:00am-4:00pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Robertson can be reached on (571)272-4186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. C./
Examiner, Art Unit 4121

/DAVID L. ROBERTSON/
Supervisory Patent Examiner
Art Unit 4121